

EPA-BBL-7195

SHOREN BROWN

[REDACTED]

01/26/2011 10:37 PM

To Palmer Hough

cc

bcc

Subject 2 of 4

1 attachment



Stratus.EPA.404c_012511.ppt

--

Shoren Brown
Bristol Bay Campaign Director
Alaska Policy Director
Trout Unlimited
1326 Fifth Avenue Suite 450
Seattle Washington 98101
C:202-674-2380
sbrown@tu.org



Water Quality and Hydrologic Issues Related to the Pebble Project, Alaska

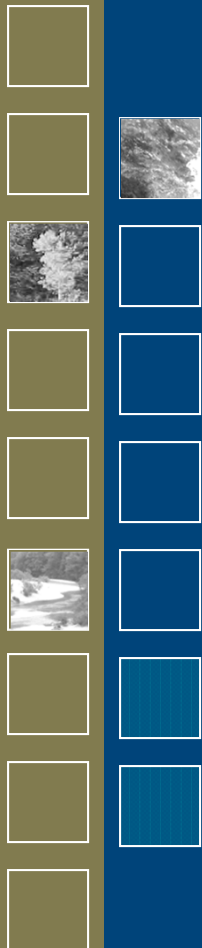
Ann Maest, PhD, Cam Wobus, PhD, and Connie
Travers, MS
Stratus Consulting, Inc.
Boulder, CO

27 January 2011



Overview

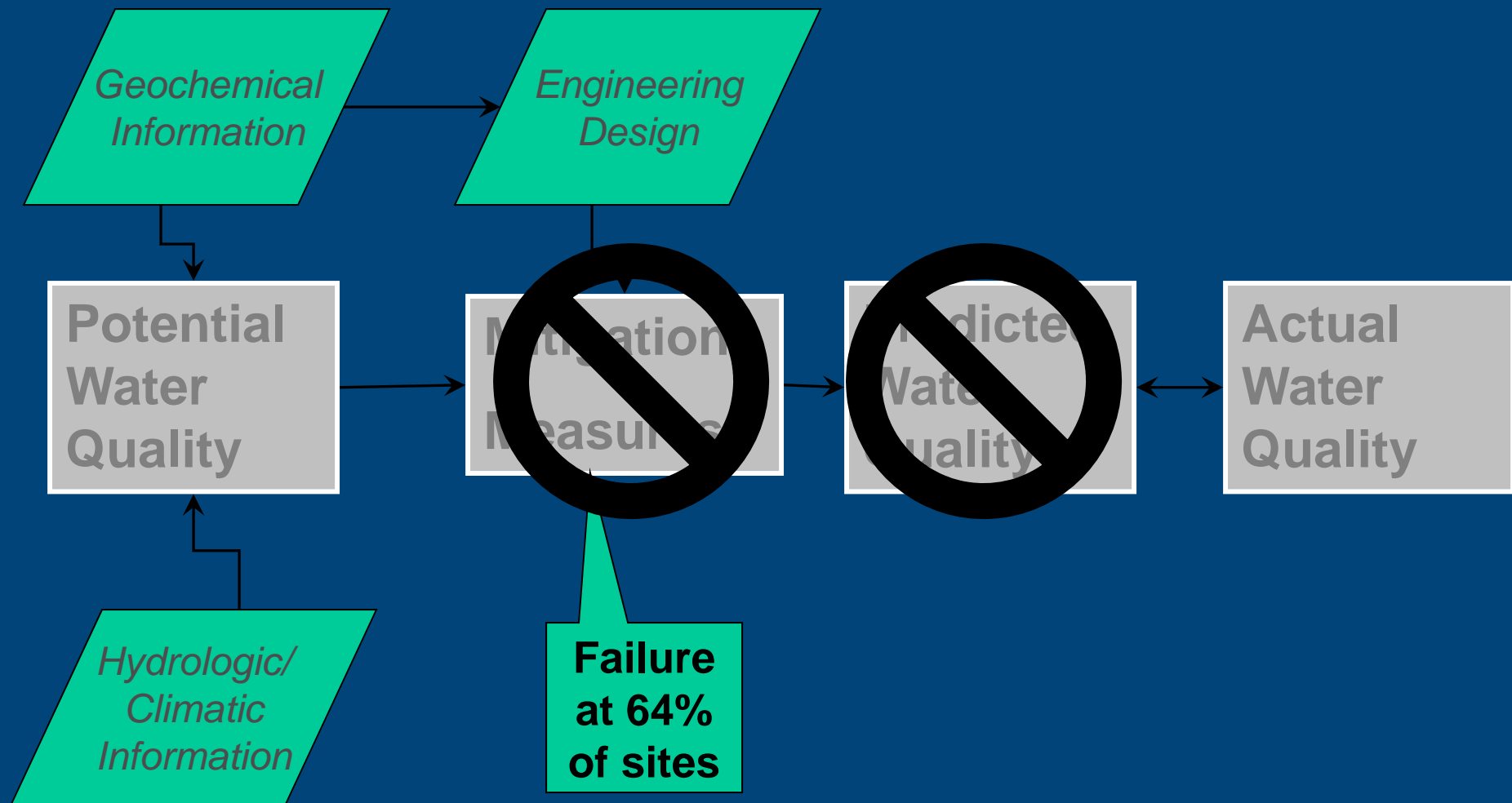
- Environmental record at large hardrock mines
- Overview of hydrology and geochemistry at Pebble Project
 - Purpose: evaluate site-specific vulnerabilities of migratory and resident fish to mining impacts



Performance Evaluation: Comparison of Predicted and Actual Water Quality at US Hardrock Mines

- Examined performance at large hardrock mines in the U.S.
 - 183 major mines, 137 NEPA mines
 - 71 NEPA mines reviewed
- 104 EISs reviewed for 71 mines
- Compared EIS predictions to actual water quality for 25 case study mines

Predicted vs. Actual Water Quality



Performance Evaluation: Post-Mining Surface Water Quality

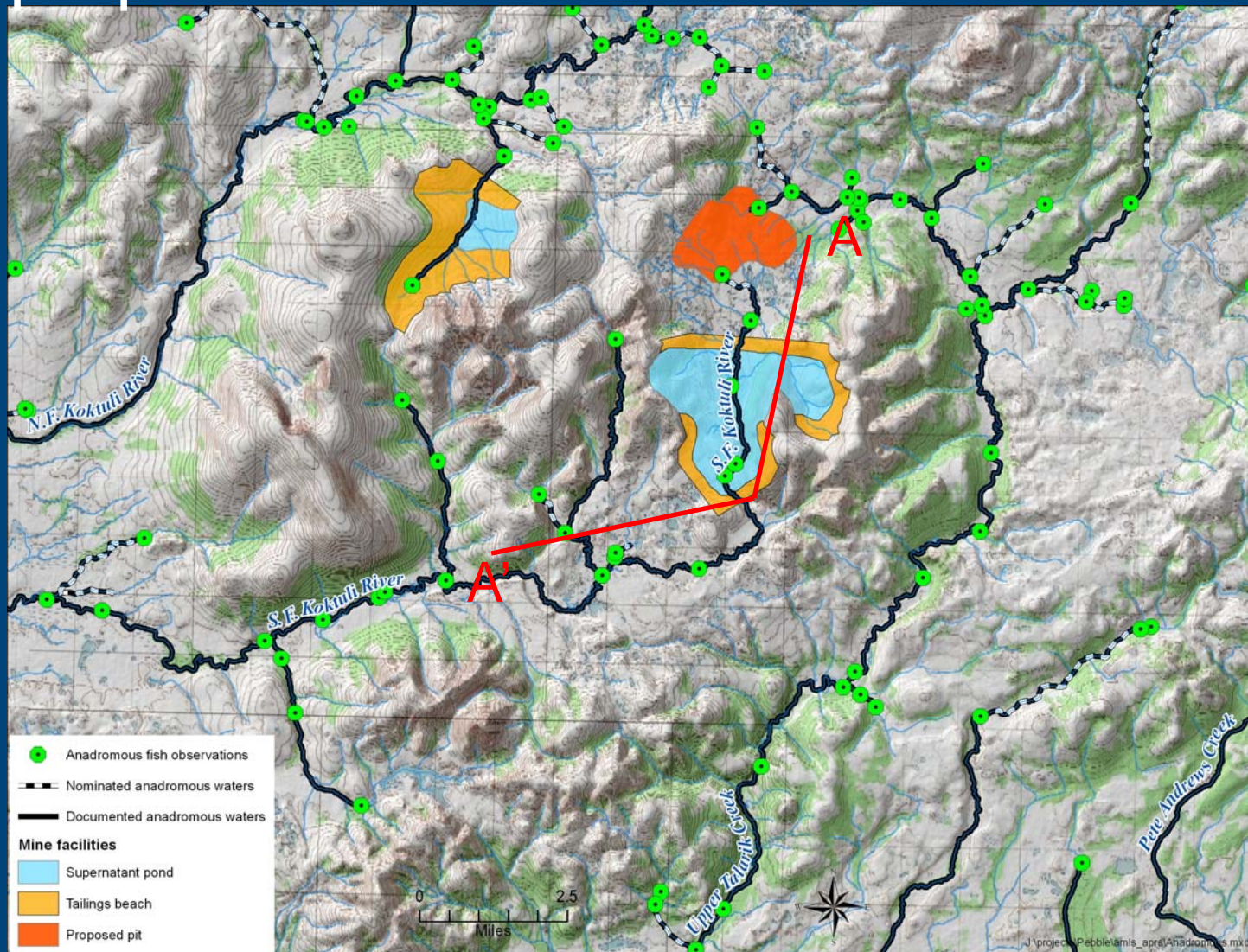
| | # Mines | Percent (%) with Impact to Surface Water | Percent (%) with Exceedences of Standards in Surface Water | Percent (%) with Exceedences that Predicted no Exceedences |
|---|---------|--|--|--|
| Mines close to surface water with mod/high ADP or CLP | 13 | 92 (12/13) | 85 (11/13) | 91 (10/11) |
| All case study mines | 25 | 64 (16/25) | 60 (15/25) | 73 (11/15) |

Performance failures at virtually all case study mines in proximity to surface water. Primary causes of failure: inadequate mitigation measures and geochemical characterization.

Factors that Increase Environmental Vulnerability at Mine Sites

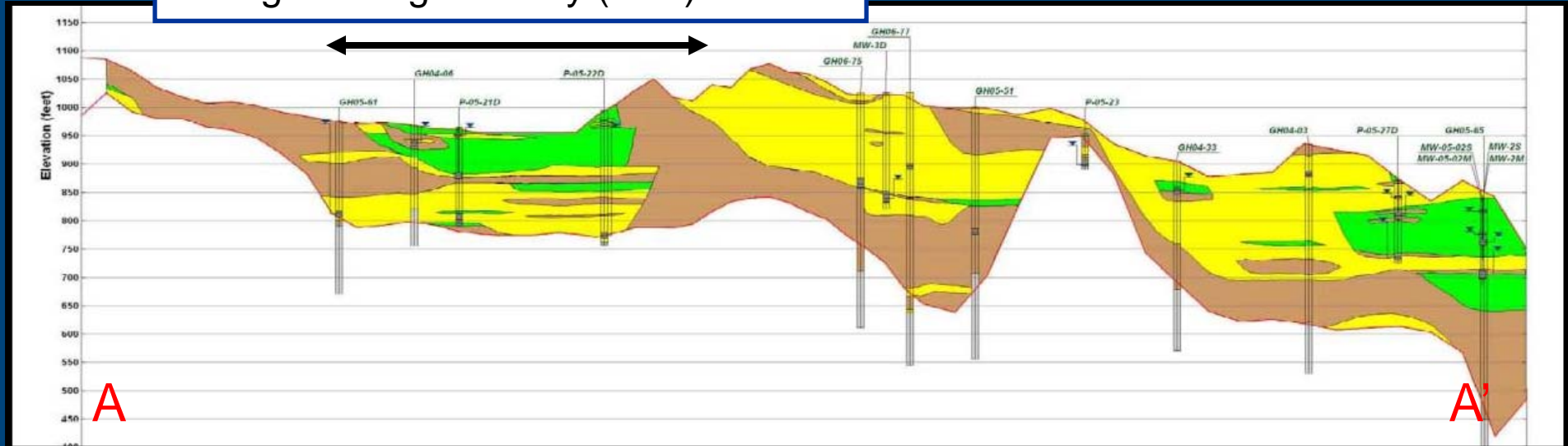
- Proximity to sensitive environmental biota and water resources
- High degree of hydrologic connection
 - Increases transport of heavy metals – low ability to control wastes
 - Watershed coverage (with wastes) changes hydrograph and upwelling areas
- High potential to leach contaminants
 - Ore and wastes will generate acid and leach heavy metals
- Low buffering in streams
 - Low hardness, alkalinity, DOM in streams

Pebble Site –Sensitive Biota throughout proposed mine site



Site Hydrogeology

Tailings Storage Facility (TSF) Site A



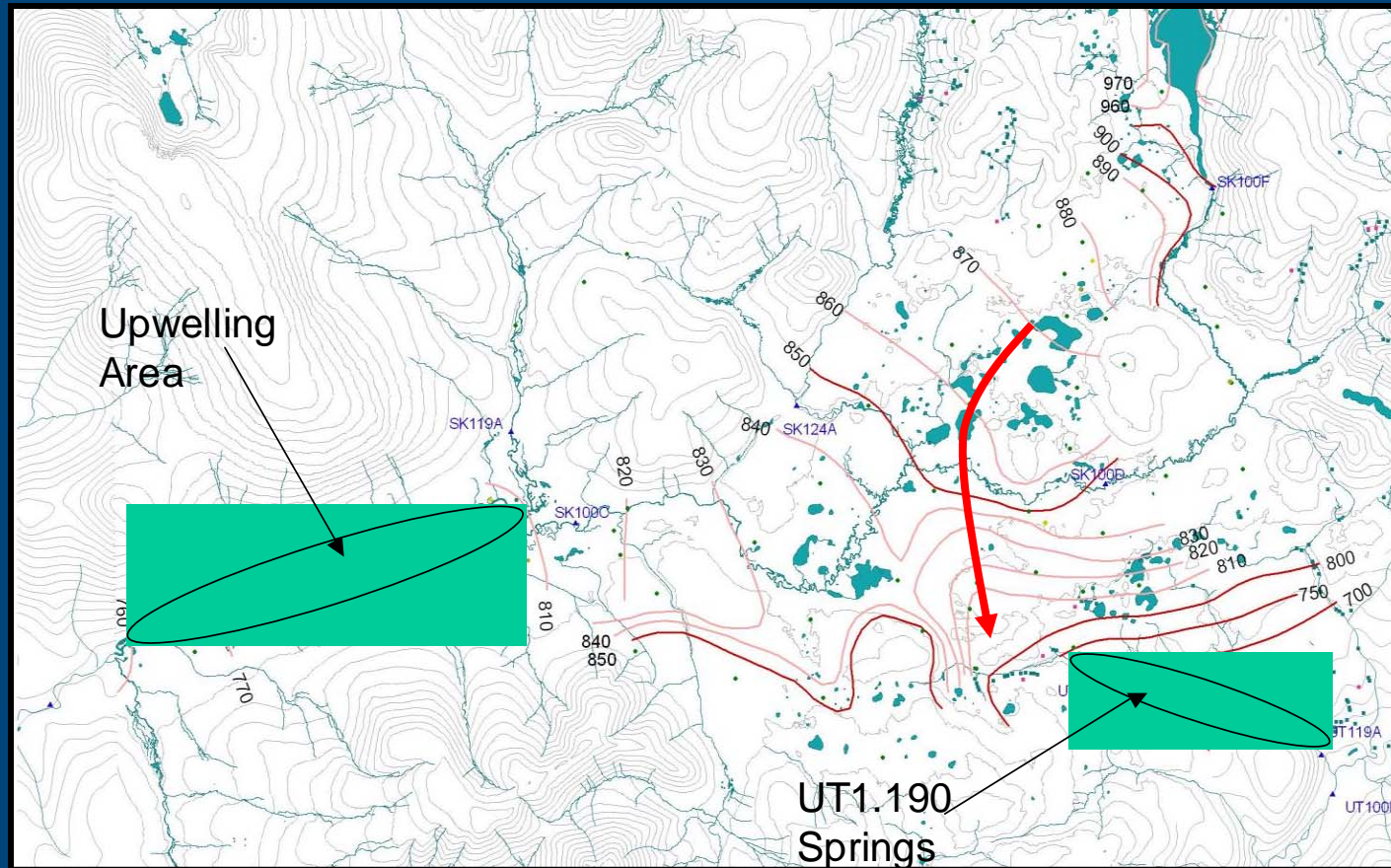
- 200+ ft of highly permeable sand and gravel
 - *Easy movement of contaminants*
- Unlined tailings storage plans rely on low K materials
 - *Not present beneath all tailings areas*
- Resource estimates have grown since 2006 water rights application (only for Pebble West!)
 - *Mine facility footprints will be larger*

Legend

- Sand, silty sand
- Clay, silty clay
- Gravel, gravelly sand
- No recovery
- Bedrock
- Borehole screen
- ▼ Water level elevation
(data from August 14-16, 2006)

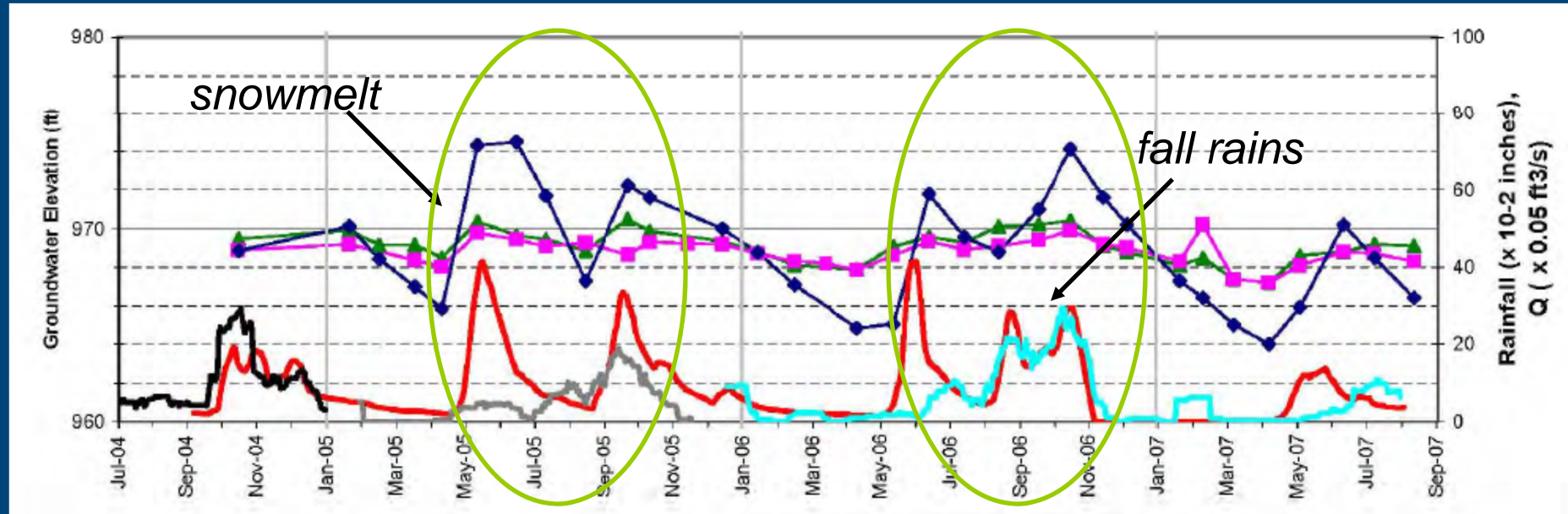
Sources: WMC, 2008; NDM, 2006 SFK water rights application

Natural Water Transfers

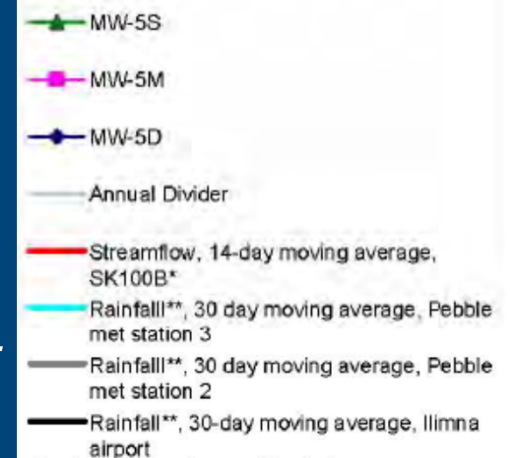


- ~25 cfs of surface water moves from SF Koktuli to Upper Talarik basin – *contaminants will cross basins*
- Groundwater upwelling – *salmon spawning reduced if upwelling reduced*

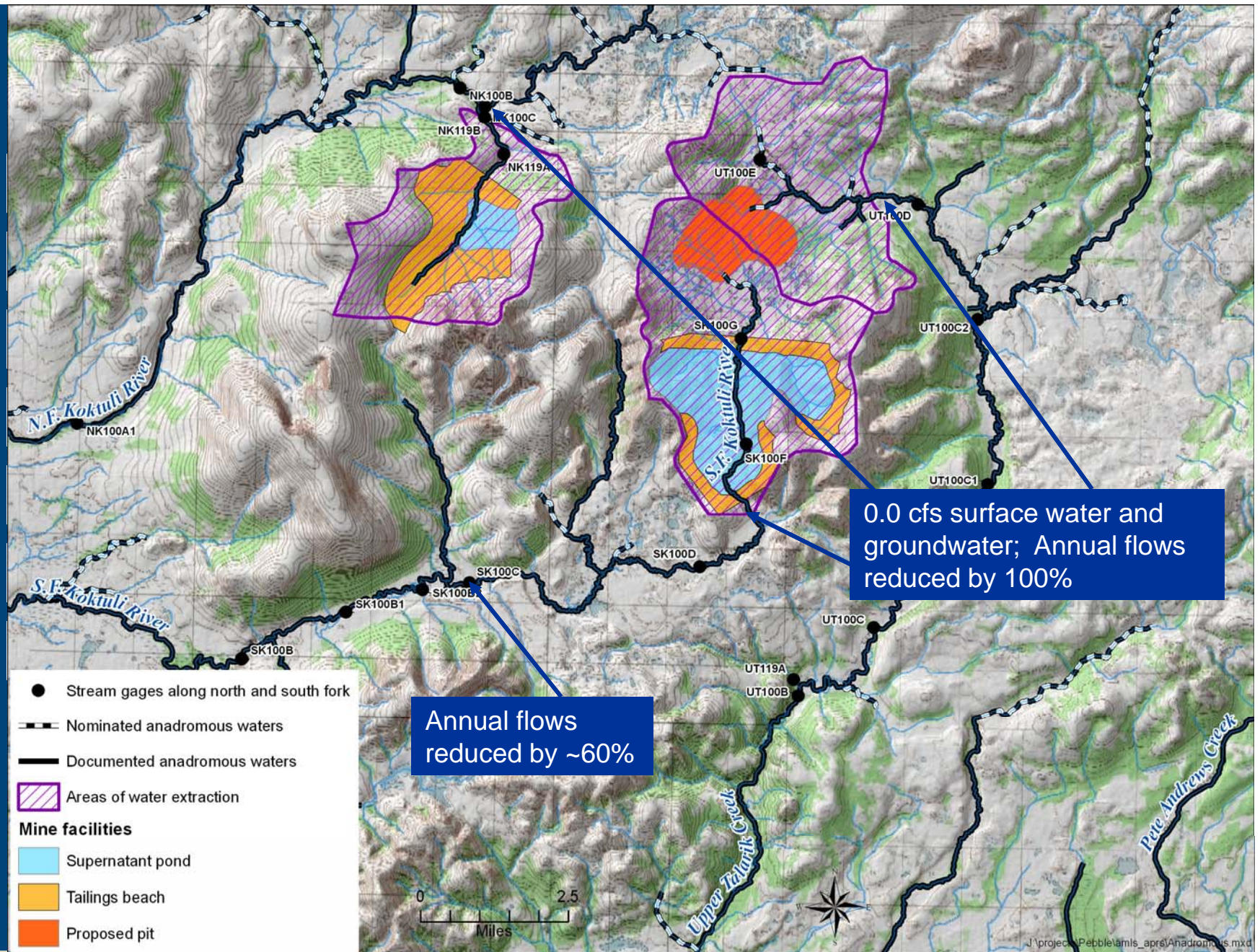
Surface Water and Groundwater Connections (just upstream from proposed TSF)



- Deep groundwater responds to changes in surface water flow and precipitation
 - *Conduits for flow between surface water and groundwater*
 - *Contaminant migration pathways beneath TSF*



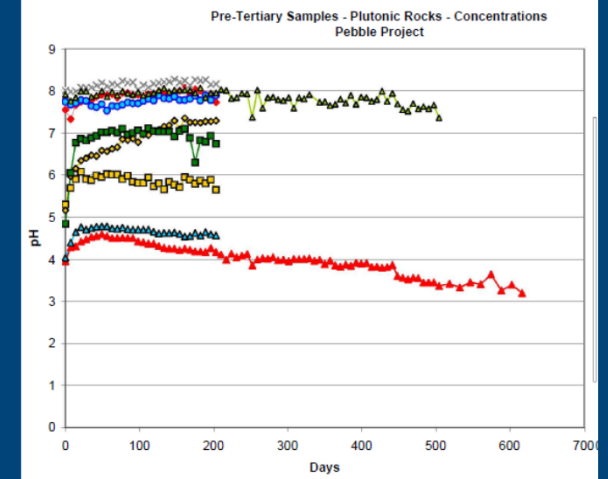
Source: WMC, 2008



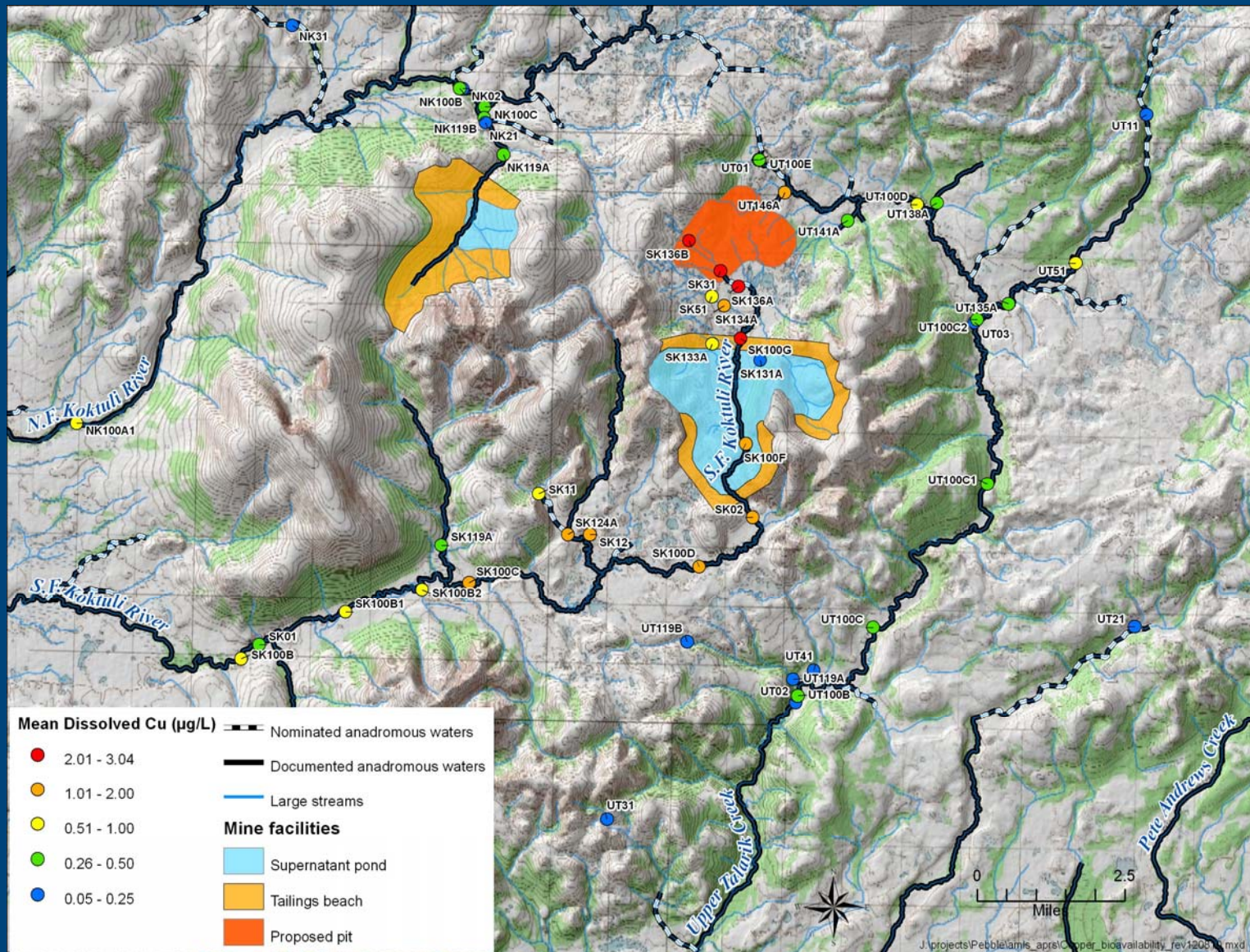
Site Geochemistry

Water Quality Baseline

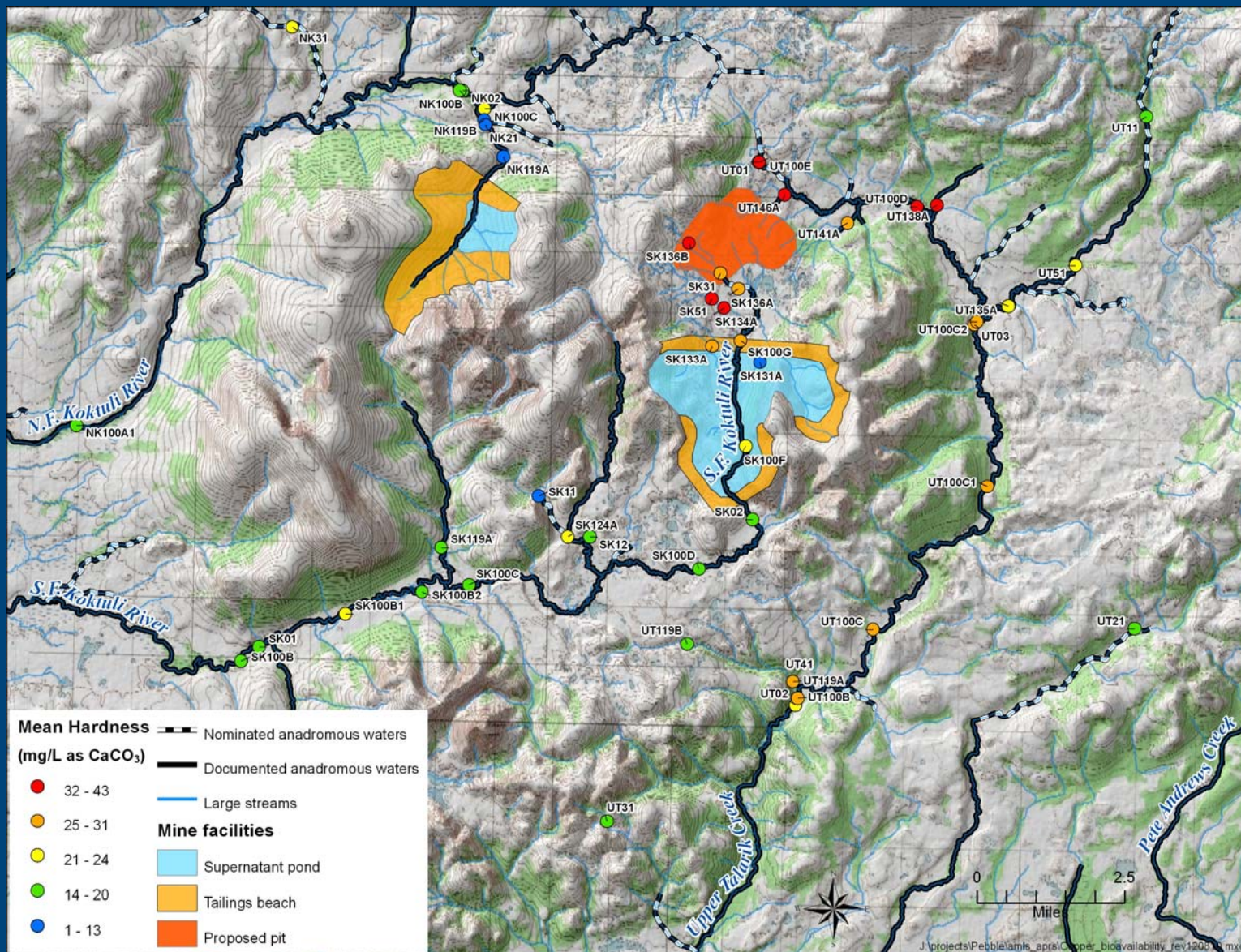
- Deposit is an acid-producer
 - “...it would take about 40 years for nearly all pre-Tertiary rock to become acidic under site conditions.” (NDM, 2005)
- Low alkalinity (~10-30 mg/L as CaCO_3), hardness and DOM
- Higher susceptibility to stream acidification and metal toxicity to fish



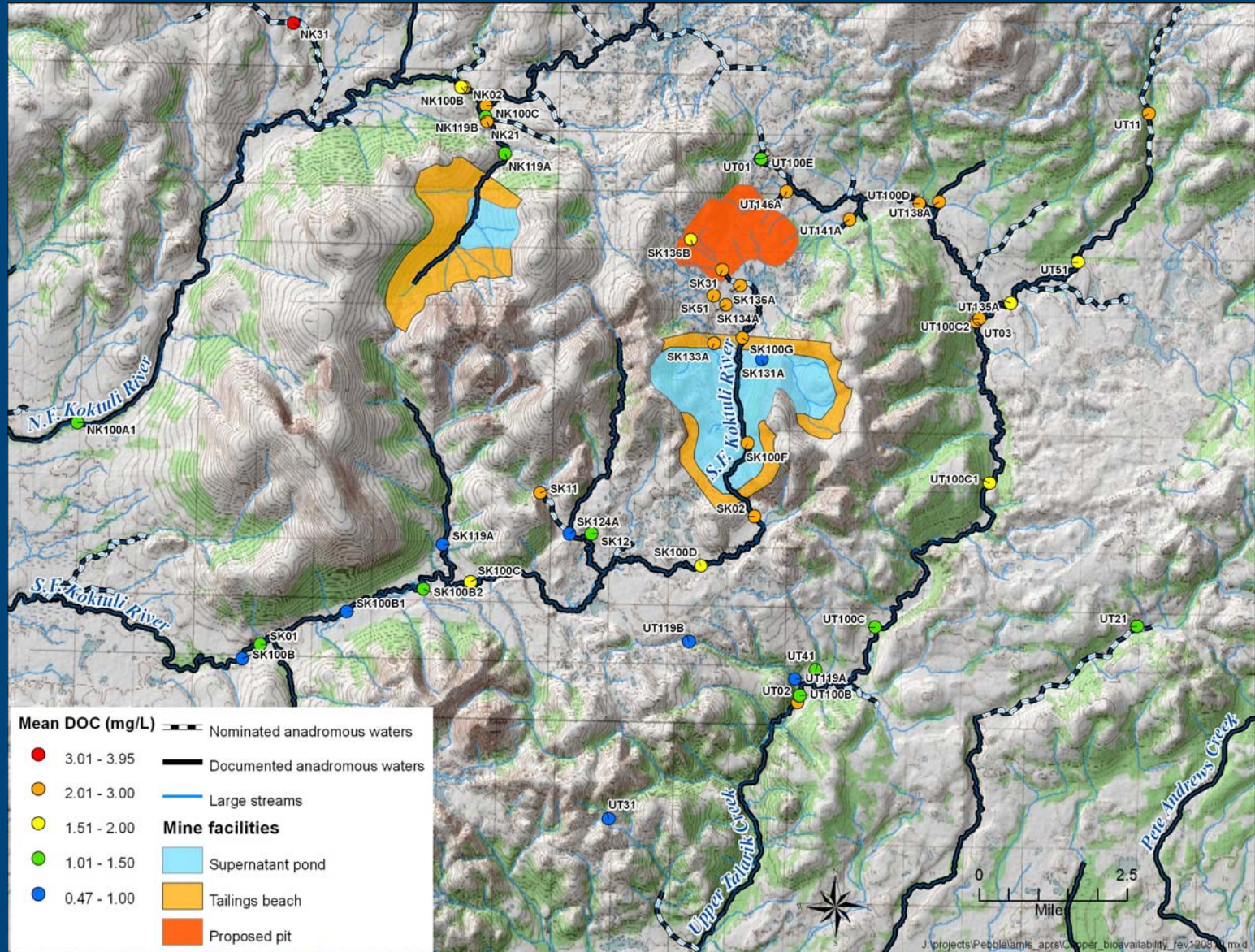
Mean Dissolved Copper Concentrations



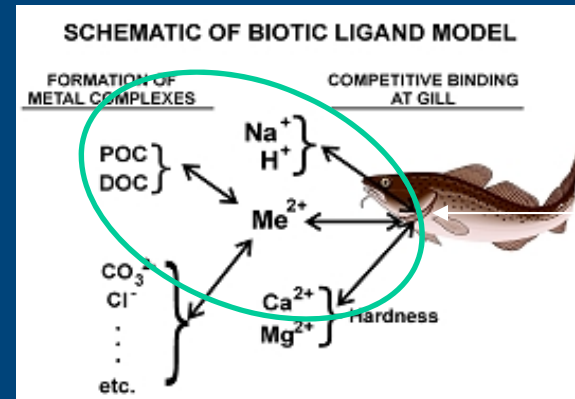
Mean Hardness Values



Mean Dissolved Organic Carbon



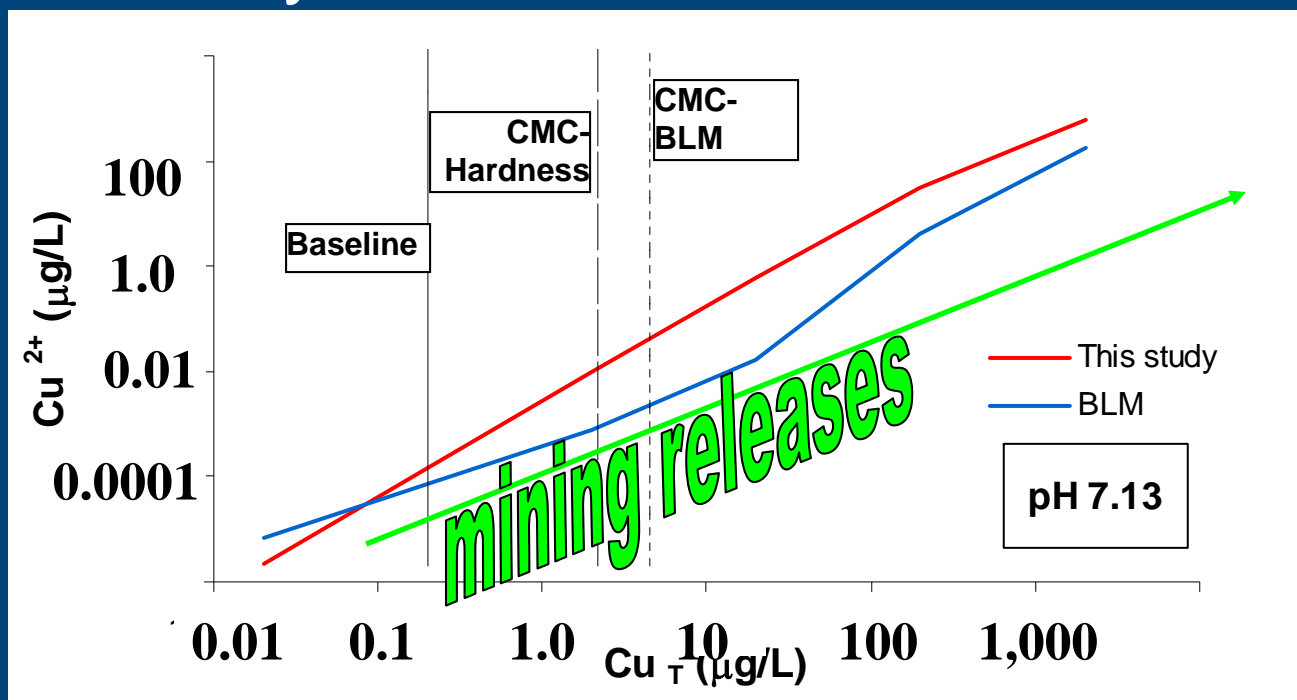
Site-specific Cu Binding Studies



- Purpose: Evaluate binding properties of ambient DOM
 - Natural organic matter can bind copper and decrease toxicity to aquatic biota
- EPA has approved use of BLM for Cu acute WQC
 - “Canned” input values for DOM; if site-specific binding varies from assumptions, different toxicity
- TNC laboratory studies of site-specific copper binding in NFK, SFK, UT
 - Pebble Project DOM has less ability to complex Cu than assumed in BLM

BLM Comparison – North Fork Koktuli Site














- 2-10 times more free Cu with ambient DOM than predicted by BLM = increased Cu toxicity



Conclusions

- Failure rates at large mines are high – mitigation and prediction failures
- Pebble Project area extremely susceptible to adverse effects
 - High acid-generation and contaminant leaching potential, close proximity to water resources and sensitive biota
 - High hydraulic connectivity – extensive contaminant transport, reduced ability to control wastes
 - Streams naturally low in components that ameliorate copper toxicity and buffer pH
 - Ambient DOM has less ability to complex Cu than BLM predicts – EPA model will underpredict toxicity to salmonids at this site

Conclusions (cont.)

-  □ Mine plan guarantees irreversible adverse effects
 - Little to no experience with successfully controlling releases from mines of this size
 - Mine facilities will reduce flows, eliminate important salmon habitat, and adversely affect spawning and migration
-  □  □  □  □  □  □  □  □  □  □  □  □ □



End

